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## CONTRIBUTIONS TO URBAN GROWTH.

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The rapid growth of the population of American cities is a familiar and widely discussed statistical fact. In recent years the cities have contributed much more than their proportional share to the growth of the country's population. From 1900 to 1910 the population of urban communities increased by 35 per cent. while the population of rural territory increased by but 11 per cent. The increase in numbers in the total population for the decade was 15,977,691, and of this increase 11,013,738, or 69 per cent., was urban increase. \*

There are three possible sources of urban growth—alien immigration, natural increase (the excess of births over deaths), and migration from rural to urban communities. What is the contribution made by each of these sources? Is alien immigration, as has been suggested, the preponderant source of city growth? †

It is perhaps natural that such a rôle should be imputed to alien immigration. Of all the factors which have their part in the growth of population, immigration is the only one which in the United States is systematically recorded. The figures roll up into the millions in each decade, while the even greater number of births and deaths is only partially registered. Hence immigration looms larger perhaps in the popular estimation than its importance really deserves.

Information as to the relative share of alien immigration and natural increase, and, in relation to cities, as to the influx from the rural regions may be defective, but that need not deter us from the examination of the relative importance of these three factors in determining the growth of cities. We may indeed tread the ground of estimate rather than of enumeration, but evidence may be gathered and sifted to establish a reasonable probability. It is the purpose of this article to make such an effort.

\* Census of 1910, *Abstract*, p. 55.

† Chapin, F. Stuart, Ph.D., "Immigration as a Source of Urban Increase." *QUARTERLY PUBLICATIONS OF THE AMERICAN STATISTICAL ASSOCIATION*, September, 1914, p. 223.

Gillette, John M., "Drift to the City in Relation to the Rural Problem," *American Journal of Sociology*, Vol. 16, p. 645.

Most of the statistical data which are available for the purpose are found in the United States Census reports for 1890, 1900, and 1910, and in recent reports of the Census Bureau on Mortality Statistics. This study deals chiefly with the decade 1900-1910, but some facts will be presented for the preceding decade.

From 1900 to 1910 the urban population of the country, that is, the population of the places having, in 1910, 2,500 or more inhabitants, increased from 31,609,645 to 42,623,383—an advance of 11,013,738.\* What were the sources of this increment?†

The growth of city populations is the result of the action and interaction of a number of factors, some of which tend to augment and others to reduce the number of inhabitants. The factors which add to population are births, the coming in of people from foreign countries, and, in the case of city populations, the coming in of people from rural territory. The factors which tend to reduce population are deaths, the removal of people to foreign countries, and, in the case of city populations, removals to rural territory. It will be convenient, for the purposes of this discussion, to distinguish between births and deaths, the natural gain or loss, on the one hand, and the movements of population into and out of a given territory on the other hand.

Natural increase or decrease is determined by the difference between the number of births in a given period and the number of deaths. If the population of a territory was 1,000 at the beginning of a decade and, there being no movement of people into or out of the territory, 50 deaths and 100 births occur during the decade, the population at the end of the decade is, clearly, 1,050. The natural increase, figured on the population at the beginning of the decade, is 5 per cent. In a case of this sort, some of the 50 deaths reported would have occurred among the 1,000 persons living in the territory at the beginning of the decade, and some among the 100 children born during the decade, but the effect on population would be the same as

\* Census of 1910, Vol. I, p. 62.

† Throughout this study, the exact figures as shown in Census reports, and the exact results of computations have been presented in preference to the round numbers. This procedure has been followed for convenience in checking. It will be understood that all the figures are to be considered as, at best, approximations to the truth. In drawing conclusions from the statistics, ample allowance has been made for the presence of this factor.

though all of the 50 deaths had occurred among persons alive at the beginning of the decade. It seems clear, on the other hand, that, where immigration occurs, deaths of persons who come in after the beginning of the decade and die in the territory before the end of the decade should not be considered in determining natural increase—that such deaths should be taken into account in fixing the gain from alien immigration. This is the procedure that has been followed in preparing the present study.

It can not be too strongly emphasized that the factor of natural increase applies to the whole population at the beginning of the decade, irrespective of its origin.

The number of the people in any region is affected not only by births and deaths, but by the passing of people from territory to territory. There is a movement into American cities from the country districts and a reverse movement from the cities into the country. Any excess of the inward over the outward movement represents an increase of urban population.

Still another factor affecting population is the movement of people from foreign countries into the cities and from the cities into foreign countries. This movement includes two distinct elements. The first element consists of natives of the United States who, in a given decade, remove from American cities to foreign countries or, having been abroad at the beginning of the decade, return to cities during the decade. It is clear that persons of this class going out tend to reduce and that persons coming in tend to augment urban population. Little or no statistical information is available as to the volume of this movement to and from American cities. The incoming and outgoing movements tend to balance each other and there is reason to believe that the balance is of slight relative importance.

The other element in the movement of population between American cities and foreign countries is contributed by persons of foreign birth. Of the foreign born persons residing in American cities at the beginning of a decade, a considerable number remove during the decade to foreign countries. On the other hand, in each decade a number of persons of foreign birth enter the United States from abroad and at the end of the decade are living in urban communities.

It is evident that the foreign born persons coming to the United States in any given decade, who settle in cities and are alive and in cities at the end of the decade, add to urban population, while foreign born persons who, having been in the country and in city populations at the beginning of a decade, depart to foreign countries before the end of the decade reduce urban population. The excess of persons coming in and remaining at the end of the period over persons going out, if there be an excess, represents the increase in urban population due to the immigration of the foreign born.

*Alien Immigration.*—What part of the urban increase from 1900 to 1910 was due to alien immigration? It is clear that the effect on population of the coming in of aliens is both direct and indirect. The direct effect is the gain due to the arrival of persons born abroad. The indirect effect is the gain due to the births of children of immigrants and of their children's children. All but a very small portion of the native born population of the United States is an indirect effect of immigration which has occurred during the last three centuries.

In undertaking a statistical study of the sources of urban increase it is necessary to keep within the limits set by the character of the evidence. As to persons actually born abroad, the statistical evidence is fairly complete; as to their children, it is much less complete. Children of the third and fourth generation are, for statistical purposes, indistinguishable from the rest of the native born population. In this article only the direct effect of immigration—the increase in population due to the coming in and survival of persons born abroad—will be considered.

The gain in the population of a given territory in a decade through alien immigration is a composite result. The first element is the whole number of foreigners who entered the territory during the decade, less those who left the territory and those who died during the period. This is the addition to the population made by alien immigration. But the increase by such immigration consists of such addition, less a deduction for those foreigners who were in the territory at the outset of the decade who during the period left the territory. The distinction between the addition to population through alien

immigration, and the net increase of the population through such immigration is an important one for the inquiry which is here undertaken.

What we have called the addition to the population through alien immigration, namely, the foreigners who having arrived in a given territory during the decade were found living in it at the end of the period, is the exact equivalent of the number of persons of foreign birth in the territory at the end of the decade who had been in the country 10 years or less. Information as to the number of residents of urban communities who, in 1910, had been in the United States 10 years or less, is supplied by Census reports.

Of the 9,745,697 foreign born persons living in urban communities on April 15, 1910, 3,559,571 are reported as having arrived in this country after January 1, 1901. For 823,124 more the time of immigration is not reported. If it be assumed that the proportion of persons who immigrated after 1900 is the same for this latter group as for all persons the year of whose immigration is known, 39.9 per cent., the total number of foreign born persons surviving in 1910 who came to the United States subsequent to January 1, 1901, was 3,887,997. \*

The Census of 1900 was taken as of June 1, and some foreign born persons found in cities in 1910 must have entered the country between June 1, 1900, and January 1, 1901. The number of these survivors is not exactly known, but may be estimated, either by reference to the number of survivors who entered the country from January 1, 1896, to January 1, 1901; or by reference to the number who came in from January 1, 1901, to January 1, 1906. If it be assumed that the number of foreigners living in American cities in 1910 who came to the United States in the 7 months from June 1, 1900, to January 1, 1901, stood to the number of those who came in the 60 months from January 1, 1896, to January 1, 1901, in the relation of 7 to 60, they must have numbered approximately 105,759. † In such a case the total number of foreign born residents

\* Census of 1910, Vol. I, pp. 1021-2. Even if it were assumed that all of the 823,124 persons for whom year of immigration was not reported had arrived in this country within 10 years (and it is certain that all of them did not), the number of foreign born persons of less than 10 years' residence would be 4,382,695, a number which is 39.8 per cent. of the total urban increase.

† Census of 1910, Vol. I, pp. 1019-22. The number of persons found in cities in 1910 who arrived in the United States from January 1, 1896, to January 1, 1901, has itself been estimated by assuming that the ratio of urban residents of foreign birth to all residents of foreign birth was the same for persons who came in from 1896 to 1901 as for persons who came in from 1901 to 1906.

found in the cities in 1910 who had entered the country after the 1900 Census would have been 3,993,756. If, on the other hand, the number of foreign born residents of American cities in 1910 who entered the country in the 7 months from June 1, 1900, to January 1, 1901, be calculated in the ratio of 7 to 60 with reference to the foreign residents of 1910 who entered the country in the 60 months succeeding January 1, 1901, their number would be 202,517. In this case the total number of foreign born residents of 1910 who entered the country between the Census of 1900 and the Census of 1910 would have been 4,090,514. Neither of the estimates is more than approximately correct. Both fail to take account of the operation of the death rate which has presumably had a greater effect on the earlier immigrants than on the later, or of the general increase in the amount of annual immigration. Hence, the first assumption will result in an under-estimate and the second in an over-estimate. It is clear in any case that 4,090,514, the largest figure cited, the sum of a known figure and the maximum estimate, represents the maximum contribution to city populations made by alien immigration between the Census of 1900 and that of 1910.

The fact indicated by the foregoing figures is the contribution made by immigration to urban population, while the fact which we are seeking to establish is the contribution made by population to urban increase. As has been seen, contributions to population and contributions to increase are two very different things. Some foreign born persons living in American cities in 1900 left the country before the Census of 1910, and in attempting to determine the net increase due to immigration the number of these persons, if ascertainable, should be deducted from the number of foreign born persons found in cities in 1910 who had come to the United States within 10 years.

As the number of foreign born persons who emigrated from the United States, whether large or small, is to be deducted from the number of immigrants, it is evident that the figure cited above—4,090,514—represents, not only the maximum contribution of immigration to urban population, but the maximum contribution of immigration to urban increase. Is it possible to estimate closely immigration's minimum contribution to urban increase?

In order to ascertain the exact number of foreign born persons found in American cities in 1900, who emigrated from the country before 1910, it would be necessary to determine, not merely the number of persons who left the United States between 1900 and 1910, but the number departing in that period who were in the country in 1900, and were living in urban communities in 1900.

The reports of the United States Commissioner-General of Immigration show the total immigration to the United States for the years 1901-1913,\* inclusive, and the number of aliens emigrating from the country for the years 1908-1913, inclusive. The emigrants are classified according to length of residence in the United States. If it be assumed that the ratio of departure to arrivals was the same for the years 1901-1907, inclusive, as for the years 1908-1913, inclusive, and that the distribution of the emigrants according to length of residence was the same for each year from 1901 to 1910, inclusive, as for the six-year period mentioned, then the approximate number of aliens in the United States in 1900 who left before 1910 was 782,423. This estimated number does not include those foreign born persons living in cities in 1900, and leaving the country before 1910, who were citizens of the United States at the time of their departure. It does include, however, aliens leaving the country between 1900 and 1910 who returned to the United States and to city populations again before 1910; and, what is more important, aliens who were living, in 1900, not in cities but in rural communities. It is believed that the inclusions outweigh the exclusions by a wide margin; hence that 782,423 represents the maximum number of foreign born persons found in urban communities in 1900 who left the country prior to 1910; and that, even when allowance is made for the fact that 4,090,514 is a maximum figure for the foreign born in urban communities in 1910 who came in after 1900, this number, less 782,423, that is, 3,308,091, represents the minimum contribution of immigration to urban increase.

As has been seen, the gain in urban population from 1900 to 1910 was 11,013,738. The maximum contribution of immi-

\* The years to which the immigration statistics, referred to in this paragraph, relate are fiscal years ending June 30.



gration has been fixed at 4,090,514; the minimum has been estimated as 3,308,091. Hence the gain due to immigration does not exceed 37.1 per cent., and probably does not fall short of 30.0 per cent. of the total urban gain.

The facts regarding the contribution of immigration to urban population in the decade 1900-1910 may be compared, roughly, with facts for the preceding decade. The Census of 1900 does not show year of immigration of foreign born residents for all urban communities, but such information is available for cities which had, in 1900, 25,000 or more inhabitants. There were, in the 161 cities comprising this group, 1,323,234 persons of foreign birth who were reported as having been in the United States less than 10 years, and 380,543 foreign born persons for whom length of residence was not reported.\* Assuming that the proportion of persons who had entered the country within 10 years was the same for the group last mentioned as for all persons the year of whose immigration was known, 27.8 per cent., the number of immigrants of less than 10 years' residence was 1,429,025. And as the population of cities having 25,000 or more inhabitants in 1900 increased in the decade 1890-1900 from 14,903,162 to 19,757,618, an increase of 4,854,456 persons,† immigration's contribution to population constituted but 29.4 per cent. of the total gain.

It should be remembered that the facts just given for the decade 1890-1900 relate to immigration's contribution to urban population rather than to urban increase. As available information concerning the volume of emigration is less complete for this decade than for the decade 1900-1910, it seems inadvisable to attempt an estimate of the gain in city population which is traceable to immigration.

Had immigration been the chief cause of urban increase in the 20 years from 1890 to 1910, there would have been, necessarily, an advance from census to census in the proportion of foreign born persons in the urban populations. The number of foreign born persons in urban populations is much less than half the total population, and hence any increase in the number of foreign born as great as or greater than the increase in

\* Census of 1900, Vol. I, pp. 958-9.

† Census of 1900, Vol. I, p. lxxiii.

the number of native born would mean a considerable increase in the proportion of foreign born persons in the population.\* The proportion of foreign born whites in communities of 2,500 or more inhabitants, classified by size, is shown by the following table for the dates 1890, 1900, and 1910:

FOREIGN BORN WHITES IN URBAN POPULATIONS. (a)

Groups of Communities.	Per Cent. of Foreign Born Whites in		
	1910.	1900.	1890.
All urban communities.....	22.6	22.2	24.8
Communities of from			
2,500 to 10,000 inhabitants.....	13.9	14.0	16.5
10,000 to 25,000 inhabitants.....	17.4	18.3	21.1
25,000 to 100,000 inhabitants.....	20.2	20.0	23.0
100,000 to 500,000 inhabitants.....	22.1	23.8	27.4
500,000 or more inhabitants.....	33.6	31.1	36.2

(a) Census of 1910, Vol. I, p. 173.

It will be noted that, for all urban communities and for each of the groups included in the table, the proportion of foreign born whites was lower in 1900 and in 1910 than in 1890. For the urban communities as a whole, and for two of the five groups of cities, the proportion of foreign born whites was slightly higher in 1910 than in 1900, but, as the native born persons in the population everywhere outnumber the foreign born, the figures do not mean, in any instance, that the numerical increase in the foreign born has been greater than the numerical increase in the native born.

*Natural Increase.*—The natural increase of population in American cities from 1900 to 1910 is not known from direct statistical evidence as in other countries, but can be approximately determined by estimate. A method for determining the natural increase of the population of the United States is indicated in the Census of 1910.† The natural increase for

\* Thus, if to a population of 1,000 persons, of whom 750 were native born and 250 foreign born, there were added 100 native born and 100 foreign born, the proportion of foreign born would advance from 25 per cent. to 29 per cent. If, on the other hand, 100 native born persons and 100 foreign born were added to a population of 1,000 persons of whom 400 were native born and 600 foreign born the proportion of foreign born persons would fall from 60 per cent. to 58 per cent. Clearly, the effect of increments to different classes of the population on the proportion of these classes to total population depends, not only on the numerical size of each increment, but on the proportion which the class is of the total population.

† Census of 1910, *Abstract*, p. 78.

the country as a whole equals, approximately, the difference between the aggregate population of 1900 and that of 1910, less the number of foreign born whites enumerated in 1910 who had arrived in this country subsequent to 1900. The total population was 75,994,575 in 1900 and 91,972,266 in 1910, and the number of foreign born whites enumerated in 1910 who came to the United States after 1900 was 5,313,659.\* Hence the increase not due to immigration was, approximately, the difference between 91,972,266 less 5,313,659 and 75,994,575, or 10,664,032. The rate of natural increase, figured on the total population for 1900 was, accordingly, 14.0 per cent. What is the relation between this rate for the population as a whole and the rate of natural increase for urban population? Is natural increase more or less rapid in the cities than in the country as a whole, and how great is the difference?

In order to answer these questions it is necessary to consider deaths and births in the whole population and in city populations. While there are no mortality statistics for the whole population of the United States, death rates are available for the registration area and for registration cities having, in 1910, 10,000 or more inhabitants. The crude death rates for these areas should not be applied to the total population of the country and to the total urban population without making corrections for differences in the proportion of Negroes in the several population groups.† In all large populations the death rate for Negroes is much higher than the death rate for whites. Reasonably satisfactory results may be obtained by applying the death rates for colored persons‡ and whites,

\* Census of 1910, Vol. I, pp. 1019-22. The figure presented is the sum of the reported number of foreign born persons enumerated in 1910 who came to the United States after January 1, 1901, and the estimated number of persons who came in from June 1, 1900, to January 1, 1901. The estimate was made by the method employed in determining the number of foreign born persons of less than 10 years' residence in the urban population and described above, p. 658. A maximum of 5,376,635 and a minimum of 5,250,683 were computed, and it was assumed that the actual number lies midway between these figures. The results obtained in the application of the estimate will not be appreciably affected by any error that may arise through this assumption.

† It would not be necessary to attempt to correct for differences in age distribution, even were it possible to do this, as there is no reason to believe that the relation between ages in the total population and ages in the total urban population differs greatly from the relation between ages in all registration territory and ages in registration cities.

‡ In the mortality statistics of the Bureau of the Census the returns for Negroes are not distinguished from the returns for the rest of the colored population. Negroes, of course, constitute a very large proportion of the total colored population.

respectively, in the registration populations, to corresponding groups in the whole population. In the total registration area the death rate for whites in 1910 was 14.6 per 1,000; that for the colored population was 24.2 per 1,000.\* The number of whites in the total population of the United States in 1910 was 81,731,957 and the number of colored persons was 10,240,309.† Hence, the number of deaths among the whites must have been approximately 1,193,287; and the number in the colored population, 247,815. The total number of deaths was, then, 1,441,102, and the crude death rate for the country's total population, 91,972,266, was, on this basis, 15.7 per 1,000.

In registration cities in 1910, the death rate was 15.5 for whites and 26.5 for the colored population.‡ As there were 39,831,913 whites and 2,791,470 colored persons in urban communities in 1910, § the deaths among whites numbered approximately 617,395 and the deaths among colored persons approximately, 73,974. Hence, the total number of deaths for urban populations was about 691,369, and the total urban population being 42,623,383, the death rate was 16.2 per 1,000. It will be assumed that 16.2 per 1,000 is the approximate death rate for all urban communities and that 15.7 is the death rate for the total population, both urban and rural, for the decade 1900-1910.

In the absence of trustworthy birth registration statistics the number of births occurring can be estimated by studying the proportion of native born children under five years of age in the population, and the death rates affecting young children.|| In 1910 there were 10,483,695 native born children under five years of age in the total population of the United States, and 4,120,665 in the population of all urban com-

\* Bureau of the Census, *Mortality Statistics*, 1910, p. 67.

† Census of 1910, *Abstract*, p. 77.

‡ Bureau of the Census, *Mortality Statistics*, 1910, p. 67.

§ Census of 1910, *Abstract*, p. 92.

|| The migration of children under five years of age from country to city constitutes a possible source of error in estimates based on the statistics referred to. Among young children the amount of migration is, however, relatively small, and the movement from the country to the city must be balanced, at least in part, by a movement from city to country. It is probable that the influence of this factor is very slight indeed.

munities.\* These figures do not represent the number of children born in the five-year period preceding the date of the Census, but the number born in such a period who survived to the end of the period. As the death rate among young children is everywhere high, the number of births must have exceeded considerably the number of survivors.† Is it possible to determine the approximate number of births for the country as a whole and for the cities?

In 1900 the death rate for children under five years of age in the entire registration area was 51.9 per 1,000, while that for the corresponding group in registration cities was 58.0 per 1,000.‡ These 1900 rates are the most recent available for the whole registration area and for all registration cities, but rates are reported for 1911 for the entire population of the registration states and for the 50 cities having, in 1910, 100,000 or more population. Registration states may be regarded, for our purposes, as representative of the whole population. And as the 50 largest cities, while numbering a small fraction of the total number of registration cities, embrace a very large proportion of the total population of such cities, the rates reported may probably be regarded as representative city rates. In one respect the 1911 figures are superior to the 1900 figures—separate death rates are given for children under one and for children of from one to five years of age. The distinction is an important one, as mortality is always much greater in the first year of life than in the years immediately following. In 1911, for children under one year, the death rate in registration states was 112.9 per 1,000, and the average (unweighted) death rate for the 50 largest cities was 133.8 per 1,000; for children from one to five the death rate in registration states was 11.8 per 1,000, and the average (unweighted) death rate

\* Census of 1910, Vol. I, p. 413. The figures given are, in fact, the returns for native born whites and for Negroes under the age of five years. Foreign born Negroes are included, while native born colored persons other than Negroes are not included, but as the number of persons under five years of age in either of these classes is very small, and as the inclusions and the exclusions tend to balance each other, the figures cited represent, with substantial accuracy, the numbers of native born children under five in the total population and in the urban population.

† The Bureau of the Census regards the birth returns as approximately correct only in those areas for which the reported number of births in a year exceeds the reported population under one year of age by 10 per cent. or more. Bureau of the Census, *Mortality Statistics*, 1911, p. 25.

‡ Bureau of the Census, *Mortality Statistics*, 1911, p. 18.

for the 50 cities was 14.6 per 1,000.\* These rates corroborate the 1900 rates already cited—both sets of figures show higher mortality of young children for the cities than for the general population. The number of births which is followed by 1,000 survivors must therefore be greater in cities than in the country as a whole. “How much greater?” is the question.

If the 1911 rates cited are applied to the entire population of the country and to the entire urban population under five years of age for the years from 1905 to 1910, and if it be assumed that the death rates were the same at each age from one to five years, the number of births per 1,000 survivors under five years of age was 1,127 for the country as a whole, and 1,153 for urban communities.†

\* Bureau of the Census, *Mortality Statistics*, 1911, p. 16.

† To derive the number of births from the known death rates the following method was adopted: If in the cities the death rate for children under one year of age was 133.8 per thousand, this means that there would be 133.8 deaths in a year in a group of children born on a given date whose number averaged, for the year following that date, 1,000. Assuming that the deaths were distributed evenly through the year, and hence that half occurred before the group was reduced to the average stated, the number of children at birth must have been 1,067, and the number of survivors at one year of age, 933.

If we knew the number of survivors exactly one year old in the populations with which we are dealing, we would need to go no further, for we could assume that the births were to the survivors one year old in the ratio of 1,067 to 933. But our only available figure for cities is the number of children under five years of age, while the best figure available for the country as a whole, the number of children under one year of age, represents a group whose average age cannot exceed and probably falls considerably short of six months, rather than a group of children exactly one year old. For these reasons, and as information as to the number of children under one year of age is, at best, uncertain, further computation is necessary.

The death rate in cities in 1911 for children from one to five years of age was 14.6 per thousand. If the 933 survivors at one year of age, determined in a preceding paragraph, were exposed, during the following year, to the death rate of 14.6 per thousand, the number of survivors at two years, determined by the process already demonstrated, would be 920. Continuing to apply the rate of 14.6 per 1,000 until the age of five years is reached, we obtain the following figures:

Year.	Death Rate.	Population at		
		Beginning of Year.	Middle of Year.	End of Year.
First.....	133.8	1,067	1,000	933
Second.....	14.6	933	926	920
Third.....	14.6	920	914	907
Fourth.....	14.6	907	901	894
Fifth.....	14.6	894	888	882

Further application of the method by which the foregoing table was derived shows that the number of survivors half a year from the beginning of the period would be 967; the number 1½ years from the beginning, 926; the number 2½ years from the beginning, 914; the number 3½ years from the beginning 901; and the number 4½ years from the beginning, 888.

In estimating the number of births in city populations, and in the whole population, it will be convenient to regard children under five years of age on April 15, 1910, as made up of five groups. One group consists

On this basis, as the number of children under five years in 1910 was 10,483,695 for the country as a whole, and 4,120,665 for urban communities, the number of births in the 5 years preceding was 11,815,124 for the entire country, and 4,751,126 for the cities; and the number of births per year was, approximately, 2,363,025 for the United States and 950,225 for the cities. The estimated population of the United States for the middle of the five-year period was 87,977,843; and the estimated population of the cities 39,869,949.\* Hence the

of children who, having been born between April 15, 1905 and April 15, 1906, are from four to five years of age, their average age being approximately, four and one-half years. It is clear that the children of this group have been exposed to the death rate of children under one year of age for one year, and to the death rate of children under five years of age for  $3\frac{1}{2}$  years. Another group consists of children born between April 15, 1906, and April 15, 1907, who are from three to four years of age and whose average age is three and one-half years. The children of this group have been exposed to the death rate for children under one year for one year, and to the death rate for children from one to five for  $2\frac{1}{2}$  years. The third, fourth, and fifth groups are made up by the same method. Applying the principles discussed above to city populations in 1910 the essential facts and results for the five groups are as follows:

Group.	Children Born Between	Average Age, Apr. 15, 1910, in Years.	Years Exposed to Death Rate of.		Births.	Survivors, Apr. 15, 1910.
			133.8	14.6		
1.....	Apr. 15, 1905, and Apr. 15, 1906	4.5	1.0	3.5	1,067	888
2.....	Apr. 15, 1906, and Apr. 15, 1907	3.5	1.0	2.5	1,067	901
3.....	Apr. 15, 1907, and Apr. 15, 1908	2.5	1.0	1.5	1,067	914
4.....	Apr. 15, 1908, and Apr. 15, 1909	1.5	1.0	.5	1,067	926
5.....	Apr. 15, 1909, and Apr. 15, 1910	.5	.5	..	1,033	967
Total.....					5,301	4,596

In other words, 5,301 births during a period of five years resulted in 4,596 survivors at the end of the period, or every 1,000 survivors represent 1,153 births. A similar mode of calculation is followed for the country as a whole with the result given in the text.

For these calculations we are far from claiming any absolute accuracy. They are designed to establish some relationship between the country as a whole and city population as respects the frequency of births. The assumption that the death rate for children from one to five applies at all ages within these limits is only approximately correct, as mortality is everywhere greater in the second year of life than in the years that immediately follow. It will be seen, however, that the computations based on the death rates cited in the text are used, not to ascertain the relation between population and births, but rather as a means of comparing the ratio between the number of children born and the number surviving at the end of a five year period in the country as a whole, with the corresponding ratio for cities. It is believed that for this purpose the assumptions are valid; that the results obtained will not differ essentially from and will be as useful as any results that might be obtained through further manipulation of the rates, or through the application of more complicated mathematical processes.

\* Census of 1910, *Abstract*, p. 55.

number of births per 1,000 population for the country as a whole was approximately 26.9 and the corresponding figure for the cities 23.8.

The death rate for the total population has been fixed at 15.7 per 1,000; that for city population at 16.2. As in cities the birth rate is lower and the death rate higher than the country as a whole, the rate of natural increase of city populations must be materially less than the rate of natural increase of the whole population. The difference may be measured, approximately, by comparing birth rates with death rates. For every 1,000 persons in the total population there were 26.9 births each year and 15.7 deaths; the births exceeded the deaths by 11.2 per 1,000, and this last ratio represents the approximate natural increase. In city populations, on the other hand, there were 23.8 births each year and 16.2 deaths per 1,000; hence the natural increase for city populations was 7.6 per 1,000.

This last figure is not presented as a measure of the actual annual increase in city populations. Because of the many assumptions involved in the computations the use of the ratio for such a purpose would be imprudent. The ratio is offered, in connection with the corresponding ratio for the country as a whole, to show the relation between natural increase for the country as a whole and the natural increase of city populations.

An annual natural increase of 7.6 per 1,000 is 67.9 per cent. of a natural increase of 11.2 per 1,000. It has been seen that the natural increase of the total population from 1900 to 1910 was 14.0 per cent. The natural increase in city populations for the ten-year period should be about 67.9 per cent. of 14.0 per cent., or 9.5 per cent.

The urban population in 1900 was 31,609,645. A gain of 9.5 per cent. would amount to 3,002,916. As the total increase in urban population from 1900 to 1910 was 11,013,738, the fraction of this gain due to natural increase was, on the basis indicated, 27.3 per cent.

It is obvious that the figures just given do not represent the natural increase with exactness. Mention has already been made of the assumptions on which the various computations are based, and of the possible influence of the migration of



children under five years of age on the results. If, as is quite probable, the migration of young children from country to city exceeds the corresponding migration from city to country, the urban birth rate, the urban rate of natural increase, and hence, the proportion of urban gain due to natural increase, as estimated, are slightly too high. The figures given represent not the exact, but the approximate gain from natural increase. While it does not seem advisable to attempt to fix definite limits within which the true figure is to be found, the approximation is believed to be a fairly close one.

*Migration from Country to City.*—Of the three sources of urban growth two have now been considered—alien immigration and natural increase—and figures and estimates have been presented. As to the contribution made by the third source, migration from country to city, no direct evidence is available. It is clear, however, that whatever portion of the total increase is not traceable to one of the first two sources, must arise from the third. As has been seen, the total urban gain from 1900 to 1910 was 11,013,738. The maximum contribution made by alien immigration has been fixed at 4,090,514, while the gain from natural increase has been estimated at 3,002,916. If these figures may be relied upon, the minimum gain due to migration from country to city was 3,920,308 (the difference between 11,013,738 and the sum of 4,090,514 and 3,002,916), or 35.6 per cent. of the total increase. And as the minimum contribution of alien immigration has been estimated at 3,308,091, the maximum contribution of migration from country to city may be placed at 4,702,731 (the difference between 11,013,738 and the sum of 3,308,091 and 3,002,916), or 42.7 per cent. of the total gain.

*Summary and Conclusions.*—The estimates presented in the foregoing paragraphs are repeated in graphic form in the accompanying diagram. The increase in urban populations from 1900 to 1910 was 11,013,738. This increase has been distributed as follows: Alien immigration, from a maximum of 4,090,514, or 37.1 per cent. of the total increase, to a minimum of 3,308,091, or 30.0 per cent. of the total; natural increase, 3,002,916, or 27.3 per cent. of the total increase; and migration from country to city, from a minimum of 3,920,308,

or 35.6 per cent. of the total increase, to a maximum of 4,702,-731, or 42.7 per cent. of the total.

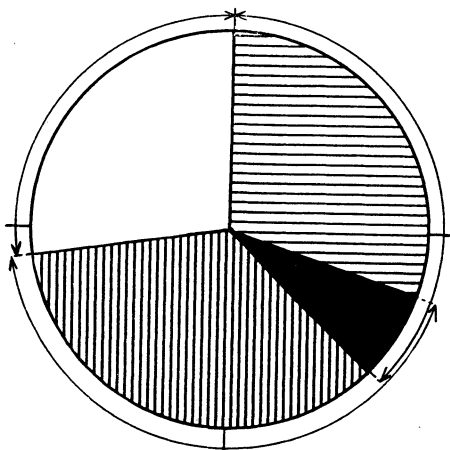
In view of the estimates and assumptions involved, the results of this study are to be accepted with a certain reserve. The Census figures seem to show that not over three eighths of the gain in urban population from 1900 to 1910 was due to alien immigration. As to the other matters considered the evidence is less definite. It is believed, however, that the statistics presented support the general conclusion that the part of the urban gain due to alien immigration probably did not fall short of three tenths of the total, that the contribution made by natural increase amounted to slightly over one fourth of the total, and that the gain from migration from country to city amounted to between one third and four ninths of the total gain. The inference seems permissible that alien immigration was not, in any sense, the preponderant source of urban growth. There is reason to believe that less than half the total gain arose from this source, and that the most potent single factor was migration from country to city.

## URBAN INCREASE FROM 1900 TO 1910

In numbers, 11,013,738 persons

Natural increase:  
27.3 per cent.

Alien immigration:  
maximum,  
37.1 per cent.;  
minimum, 30.0  
per cent.



Migration from  
country to city:  
maximum, 42.7  
per cent.; mini-  
mum, 35.6 per  
cent.